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Vaccines and vaccination in prison settings: availability and model of service delivery in 20 European countries

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Abstract

Prisons, due to various risk factors, are environments that are conducive to infectious disease transmission, with significantly higher prevalence of infectious diseases within prisons compared to the general population. This underscores the importance of preventive measures, particularly vaccination. As part of the international project “Reaching the hard-to-reach: Increasing access and vaccine uptake among the prison population in Europe” (RISE-Vac), this study aimed to map the availability and delivery framework of vaccination services in prisons across Europe and beyond. A questionnaire designed to collect data on the availability and delivery model of vaccination services in prisons was validated and uploaded in SurveyMonkey in July 2023. Then, it was submitted to potential participants, with at least one representative from each European country. Potential participants emailed an invitation letter by the RISE-Vac partners and by the European Organization of Prison and Correctional Services (EUOPRIS). Twenty European countries responded. Vaccines are available in European countries, although their availability differs by country and type of vaccine. The first dose is offered to people living in prisons (PLP), mostly within one month, COVID-19 is the most widely offered vaccine. In all countries, vaccines are actively offered by healthcare workers; in most countries, there is no evaluation of vaccination status among people who work in prison. The survey shows variance in vaccine availability for PLP and staff across countries and vaccine types. Quality healthcare in prisons is not only a matter of the right to health but also a critical public health investment: enhancing vaccine uptake consistently among PLP and staff should be prioritized.

Keywords Vaccination, Immunization, Prevention, Infectious diseases, Prisons

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Introduction

Prisons and other places of detention are environments that are conducive to the transmission of infectious diseases among people who live and work there. This is attributed to various risk factors, with environmental, individual, and organizational factors being the primary contributors. Firstly, many prisons face environmental challenges, including overcrowding and inadequate ventilation, which can facilitate infection transmission [1]. Secondly, people living in prisons (PLP) are often more likely to engage in risk behaviors compared to the general population, primarily due to diminished risk perception [2]. Thirdly, a large proportion of PLP lack access to proper healthcare services in prisons, either due to the unavailability of such services or a shortage of healthcare providers [3]. These risk factors explain the heightened vulnerability of the prison population to infectious diseases.

Numerous outbreaks of infectious diseases have been documented in prison settings worldwide, resulting in significant incidence and mortality among PLP. In the United States, for example, from April 2020 to April 2021, the Coronavirus Disease 2019 (COVID-19) pandemic alone resulted in over 394,000 new infections and 2,555 deaths, for a cumulative incidence rate of 30,780 per 100,000 persons [4]. At the same time, the standardized mortality rate for PLP stood at 199.6 per 100,000, which was 2.5 times higher than that of the general population in the US [4]. The issue of infectious disease outbreaks in correctional facilities, however, is not limited to COVID-19 but extends to a broad spectrum of infectious diseases, including viral hepatitis, influenza, measles, and many other diseases.

There are various strategies and interventions aimed at controlling infection transmission within prison settings [5], among them vaccination stands out as one of the most effective and cost-efficient approaches. However, there is a scarcity of data regarding the availability, accessibility, and delivery models of vaccination services within prisons, often accompanied by concerns about their quality [6]. The existing evidence suggests that only a few countries across the globe provide vaccination services within prison facilities, and these services are predominantly activated as a response to healthcare crises, such as pandemics, epidemics, and local outbreaks [6, 7]. Moreover, the interventions to enhance vaccine uptake among PLP and staff members are few and far between, with a predominant focus on disseminating knowledge and raising awareness [8–10]. Despite these efforts, several obstacles, both at the level of the individual and organizations persist, hindering access to vaccines among people who live and work in prisons [5].

The objective of this study is to map the availability and delivery framework of vaccination services in prisons across Europe as part of the “Reaching the hard-to-reach: Increasing access and vaccine uptake among the prison population in Europe” (RISE-Vac) project.

Materials and methods

RISE-Vac

This work was developed as part of the RISE-Vac project, co-funded by the European Union’s 3rd Health Program (2014–2020) under grant agreement No 101,018,353. The RISE-Vac project aims to improve the state of healthcare in European prisons by promoting vaccine literacy, enhancing vaccine offer and increasing vaccine uptake among people who live and work within European prisons. The project’s consortium consists of nine international partners from six European countries, including Cyprus, France, Germany, Italy, Moldova, and the UK. The project can also boast an international advisory board full of the leading lights of prison health research. More information regarding the project can be found on the project’s website (<https://wephren.tghn.org/rise-vac/>).

Procedure

This survey was one of the activities defined within the RISE-Vac work package oriented to promote evidence-informed policies for prison health systems. A questionnaire on vaccine offering was designed by the researchers and sent to the consortium and advisory board members of the project for review to ensure its internal and external validity. The questionnaire was revised based on the reviewers’ comments and uploaded to the SurveyMonkey platform (<https://it.surveymonkey.com>) in July 2023. Potential participants were invited through an invitation letter emailed by the RISE-Vac partners as well as by the EUROPRIS to their network members with assistance from the experts of the EUDA. Senior technical staff (one per country) from either the Ministry of Justice or the Ministry of Health, depending on the specific organizational structure of the country, were invited to complete the survey. Informed consent was obtained from all participants prior to their inclusion in the study. Participants received an invitation letter detailing the purpose of the RISE-Vac project, the survey procedures, and assurances of data confidentiality and exclusive use for the project’s objectives. Participation was voluntary.

Scope

Key figures from 24 countries in three continents, namely Africa, Asia, and Europe responded to our survey. These countries include Belgium (Total prison population, including pre trial detainees and remand prisoners [11]:

12,316; imprisonment rate per 100,000¹¹: 104), Croatia (4,073; 106), Cyprus (947; 103), England (87,699; 145), Finland (2,839; 51), France (75,897; 111), Ghana (14,991; 45), Ireland (1,887; 98), Italy (61,049; 104), Latvia (3,229; 172), Luxembourg (705; 107), Malta (690; 132), Moldova (6,084; 236), Nepal (27,550; 90), Netherlands (11,447; 65), Nigeria (77,934; 34), Norway (3,076; 56), Portugal (12,272; 117), Romania (23,608; 124), Slovakia (9,717; 179), Spain (54,197; 113), Sweden (8,635; 82), Uganda (75,764; 150), and Ukraine (48,038; 123).

Survey

The questionnaire consisted of 17 questions divided into three main sections. Section I comprised questions on the participant’s contact name and information; availability of national and subnational guidelines on implementing vaccination in prisons; vaccinations offered to PLP; when, to whom and how these vaccinations are offered; barriers to implementing vaccination and vaccine uptake by PLP; and the strategies and interventions implemented to overcome these obstacles at a national level. Section II aimed to collect information on vaccination for prison staff members. The questions addressed whether and when the vaccination status of the prison staff members is checked; either routine assessment of vaccine-preventable diseases among prison staff members is in place; what the main barriers towards vaccine uptake among prison staff members are; and which strategies and interventions are implemented to overcome these obstacles. Section III assessed the state of availability, accessibility, and model of delivery of services at the prison level (optional; recommended in case national data were not available). The complete questionnaire is available in Appendix 1.

Ethical aspects

The survey was conducted considering all the ethical aspects of research in biomedical sciences. As mentioned in the invitation letter, participation in the survey was entirely voluntary, and the participants were assured that their personal data (e.g., their name and contact information) would remain confidential. In addition to the considerations above, the RISE-Vac has been approved by the ethics committee of the University of Pisa (approval number: 0049433/2022).

Data extraction and analysis

The reported data, aggregated from the SurveyMonkey platform, or received directly via email from the participants, were collated in January 2024. The extracted data were collated, categorized and reported descriptively.

Results

The survey participants, delegates from the Ministry of Health or the Ministry of Justice, represented 20 European countries including Belgium, Croatia, Cyprus, England, Finland, France, Ireland, Italy, Latvia, Luxembourg, Malta, Republic of Moldova (Moldova), the Netherlands, Norway, Portugal, Romania, Slovakia, Spain (Catalonia), Sweden, and Ukraine.

Vaccination services for PLP

In European countries, the first dose or only dose of vaccines is offered to PLP within one week (6/20), between one week and a month (10/20) and after one month (2/20) from prison entrance. These data are depicted in Fig. 1A. Slovakia declared that vaccinations are suggested by medical staff during the medical examination according to the calendar specified in the Slovak Republic Ministry of Health Decree 585/2008.

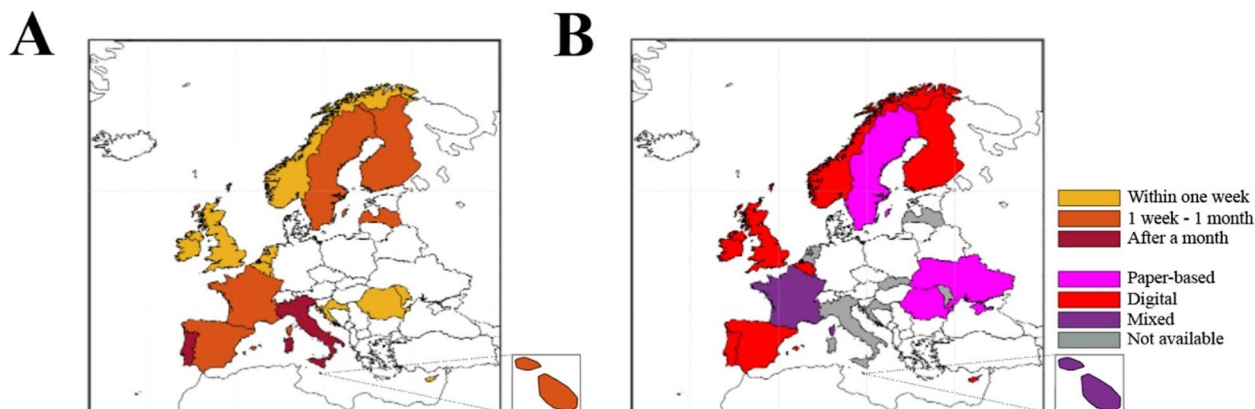


Fig. 1 Geographic representation of the data collected in Q4 and Q11. **A** 1st dose/only dose timing in PLP. **B** Characteristics of the immunization information system (IIS)

No data about time of vaccination offering has been reported by Ukraine.

Table 1 summarizes the vaccinations offered to PLP, described in detail in the following subparagraphs. Overall, the COVID-19 vaccination is the most offered vaccine in prison (100%). It is followed by influenza (Flu:95%), Hepatitis B Virus (HBV)/Diphtheria, Tetanus and Pertussis (DTP) (85%), Hepatitis A Virus (HAV:75%), Measles, Mumps and Rubella (MMR)/Pneumococcal (70%), Human Papillomavirus (HPV: 60%), Monkeypox (50%), Herpes Zoster (45%) and Meningococcal (30%) vaccinations.

COVID-19

COVID-19 vaccination is offered in all the countries surveyed. Specifically, it is either offered to everyone (14/20) or only to specific age groups (2/20). Moreover, one country offers COVID-19 vaccination to PLP with comorbidities and/or at specific age, while two countries offer it to all categories (specific age groups, vulnerable groups). Data on COVID-19 vaccination in Ukraine are missing.

Flu

Influenza vaccines are offered in 19/20 European countries; 9 of the 19 countries offer this vaccination to everyone, 2/19 countries offer it only to PLP of a specific age, and 2/19 countries offer it only to PLP with comorbidities. In addition, 1/19 countries offers vaccination to PLP of a specific age and/or at high-risk, while Moldova offers it to

PLP at high-risk and/or with comorbidities. 4/19 countries offer influenza vaccination to PLP in all these categories.

HBV

HBV vaccines are offered in 18/24 countries surveyed (EU: 17/20; non-EU: 1/4). As shown in Table 1, 11 out of the 17 European countries offer HBV vaccination to all PLP, 1/17 to PLP of specific age groups, of high-risk groups and/or with comorbidities and 1/17 to PLP of high-risk groups and/or with comorbidities. Of the remaining 4/17 countries, information about whom HBV vaccinations are offered is unavailable.

DTP

DTP vaccination is offered in 17/20 European countries. It is offered to everyone (12/17) or only to PLP with specific age (1/17) or only to PLP of high-risk groups (2/17). Conversely, 1/17 countries offers it to PLP of high-risk groups and/or with specific age. Ukraine offers DTP vaccines, but the information related to the target population is unavailable.

HAV

Vaccination is only offered in 15/20 European countries. It is offered in 6/15 countries to all PLP, 7/15 countries only to PLP in high-risk groups, and 2/15 countries to PLP in high-risk groups and/or with comorbidities.

Table 1 Vaccinations offered to PLP. The different symbols refer to whom the vaccinations are offered (✓: no specification to whom; ●: all PLP; ■: specific age group; ▲: high-risk groups; ▼: PLP with comorbidities)

Country	COVID-19	Flu	HBV	DTP	HAV	MMR	Pneumococcal	HPV	Monkeypox	Herpes Zoster	Meningococcal
Belgium	■	▼	✓	●	▲	▲	✓	▲	▼		
Cyprus	●	●	●	●			▲▼			▲	
Croatia	●	●	■▲▼		▲▼	▲▼	■▲▼				
England	■	■	●	●	▲	●	■▲	■	▲	■	■
Finland	●	●	●	▲	●	▲	■▲▼	■	▲	▲	
France	●	■	●	●	▲		●	■▲	▲		●
Ireland	■▲▼	■▲▼	✓	●	●	●	✓	●	▲	▲	
Italy	●	●	●	■▲	▲	■	■▲	■▲▼	▲	■▲	▲
Latvia	●	■▲▼		●							
Luxemburg	●	●	●	●	●	●	■▲▼	■	▲▼	●	■
Malta	●	●	●	▲	▲	▲	▲				
Moldova	●	▲▼	●	●							
Netherlands	■▼	▼	▲▼	■	▲	■	■▼	■	▲		
Norway	●	●	●	●	▲▼	●	●	▲	▲	▲	●
Portugal	●	●	✓	●	●	●		■▲	▼	▼	
Romania	●	■▲▼									
Slovakia	●	■▲		●	▲	▲					
Spain (Catalonia)	●	●	●	●	●	●	■▲	▲		■	
Sweden	■▲▼	■▲▼	●		●		■▲▼	●			■▲▼
Ukraine	✓		✓	✓		✓					

MMR

MMR vaccination is offered to PLP in 14/20 European countries. 6 out of 14 countries offer it to everyone, 2/14 countries offer it only to PLP with specific age and 4/14 offer it only to PLP in high-risk groups. Conversely, 1/14 countries offers it to PLP in high-risk groups and/or with comorbidities. Ukraine offers MMR vaccines, but no information is available about the target population.

Pneumococcal disease

Pneumococcal vaccination is offered in 14/20 European countries. In 2/14 countries, information on its distribution is not available. In 2/14 countries it is offered to everyone, and in 1/14 countries only to high-risk groups. In 4/14 countries, this vaccination is proposed to PLP: (I) belonging to high-risk groups; (II) with specific age; (III) with comorbidities. In 3/14 countries, this vaccination is proposed to PLP: (I) belonging to high-risk groups; (II) with specific age. In one of fourteen countries, this vaccination is offered to PLP: (I) belonging to high-risk groups; (II) with comorbidities. Similarly, 1/14 countries offers the vaccine to PLP: (I) with specific age; (II) with comorbidities.

HPV

HPV vaccination is offered to PLP in 12/20 European countries. It is offered to everyone in 2/12 countries, or only to PLP of certain ages in 4/12 countries or only to high-risk groups in 3/12 countries. 2 out of 12 countries offer HPV vaccination to PLP: (I) belonging to high-risk groups; (II) with specific age.

Monkeypox

Monkeypox vaccination is offered in 10/20 European countries. It is offered only to PLP from high-risk groups in 7/10 and to PLP with comorbidities in 2/10 countries. 1/10 offers vaccination to both aforementioned categories.

Herpes zoster

Herpes Zoster vaccination is offered in 9/20 European countries. Notably, it is offered to everyone in 1/9 countries, only to specific age groups in 2/9, to high-risk groups in 4/9, or to PLP with comorbidities in 1/9 countries. Moreover, it is also offered to PLP in specific age groups and/or high-risk groups in 1/9 countries.

Meningococcal disease

Meningococcal vaccination is offered in 6/20 European countries. In 2/6 countries, it is offered to everyone. Furthermore, 2/6 and 1/6 offer this vaccination only to PLP of specific age or only to PLP of high-risk groups, respectively. 1/6 offer it to PLP of all above-mentioned categories.

Other preventable diseases

As far as other vaccinations are concerned, varicella and polio vaccines are offered to all PLP by Luxembourg, whereas tuberculosis vaccines are offered by France (PLP with comorbidities) and Cyprus.

In 17 out of 20 European countries, these vaccinations are actively offered to PLP only by healthcare workers. Latvia and Slovakia offer vaccinations through healthcare workers and on request by PLP, while Cyprus offers vaccinations only upon PLP request. After release from prison, a follow-up program exists in 8 out of 20 European countries (Belgium, Cyprus, Ireland, Malta, Norway, Portugal, Spain (Catalonia) and Slovakia).

The doses of vaccine administered are usually recorded in the Immunization Information Systems (IIS), available in 14/20 European countries (3/14: paper-based, 8/14: electronic format; 3/14: mixed electronic/paper formats). These data are shown in Fig. 1B.

Implementation of the vaccination programs

National/subnational guidelines on the implementation of vaccination services in prison exist in 15/20 European countries (Belgium, Cyprus, England, France, Ireland, Latvia, Luxembourg, Malta, Norway, Portugal, Romania, Spain (Catalonia), Slovakia, Sweden, Ukraine).

In surveyed countries, vaccination programs are implemented only by healthcare staff members in 15/20 countries (Belgium, England, Finland, France, Italy, Ireland, Luxembourg, Malta, Moldova, Netherlands, Portugal, Romania, Spain (Catalonia), Sweden and Slovakia) or by the cooperation between the healthcare staff with the community health system (4/20: Cyprus, Croatia, Norway, Ukraine) or with the custodial staff (1/20: Latvia).

Table 2 summarizes the infrastructural barriers to vaccination implementation, the main barriers to vaccine uptake among PLPs and the main strategies/interventions to address them. 10/20 countries reported no infrastructural barriers and 2/20 of them also reported no obstacles to PLP vaccine uptake. As barriers to vaccination uptake, the Netherlands, and Ukraine also reported a lack of interest, knowledge and risk perception, refusal of vaccination, and lack of government/NGOs provision for regular vaccination among PLP. Regarding strategies and interventions to increase vaccine uptake, the Netherlands reported that physicians offer vaccinations if there is an indication.

Vaccination status of staff members

Figure 2 depicts the state of evaluation of the vaccination status before (Fig. 2A) and after (Fig. 2B) the employment of staff members in surveyed countries.

Among prison staff members, HBV is the most frequently vaccine-preventable disease assessed regularly

Table 2 Vaccination implementation and uptake among PLP: barriers and strategies/interventions

Country	Infrastructural barriers			Vaccine uptake: main barriers			Strategies and interventions					
	Lack of budget	Lack of Human Resources	Vaccine Shortage	Store Vaccines: lack of equipment	Lack of knowledge/ Misinformation	Conspiracy Theory/ Misbeliefs	Distrust in Prison Authorities	Vaccines are not free of charge	Knowledge dissemination	Peer- education	Question/ Answer sessions with experts	Active recommendation of vaccines/ Opt-out programs
Belgium	●				●						●	
Cyprus			●	●			●	●			●	●
Croatia	No Barriers			No Barriers								
England		●			●	●			●			
Finland	No Barriers				●	●					●	●
France	No Barriers				●	●	●		●		●	●
Ireland		●			●							
Italy		●			●		●		●		●	
Latvia	No Barriers				●				●		●	●
Luxembourg	No Barriers				●	●			●		●	●
Malta	No Barriers				●	●			●		●	●
Moldova	●				●	●	●				●	●
Netherlands	No Barriers				●							
Norway	No Barriers				No Barriers							
Portugal			●		●							●
Romania	●						●					
Slovakia	●		●					●				●
Spain (Catalonia)	No Barriers				●			●		●		●
Sweden	●				●							●
Ukraine	No Barriers				●		●			●		●

Healthcare staff offer vaccination based on clinical indications

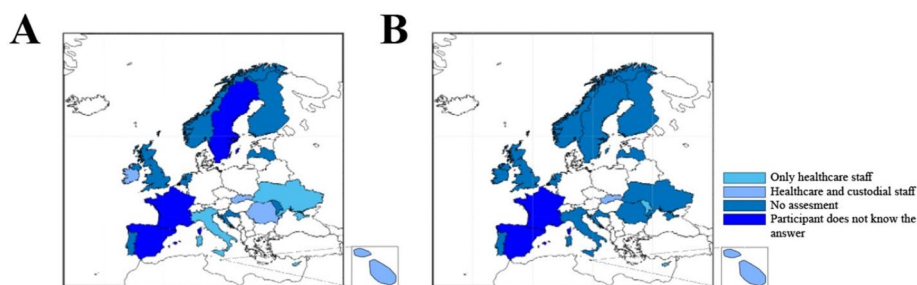


Fig. 2 Geographic/bar representation of the data collected in Q12, Q13 and Q14. **A** Checking of the vaccination status of prison staff members before employment. **B** Checking of the vaccination status of prison staff members regularly after employment

(38.89%), followed by Flu/COVID-19 (27.78%), and DTP (16.67%). Overall, 61.11% of countries reported not conducting any routine evaluation among prison staff members. No information was available for Sweden and Ukraine Table 3.

Table 4 breaks down the main barriers related to vaccine uptake among staff members. Lack of knowledge/misinformation, conspiracy theory/misbelief and costs of vaccines were mentioned in 10/20, 6/20 and 2/20 European countries, respectively. One country (the Netherlands) declared the absence of interest from staff members, and the absence of barriers was reported by five European countries (Belgium, England, Luxemburg, Norway, and Romania). Ukraine identifies barriers other than those described above, but no details are available

Considering only the countries where barriers were identified, the approaches used to facilitate vaccine uptake among staff members are knowledge dissemination (in 10/15 countries), peer education (2/15), question-and-answer sessions with experts (3/15) and active recommendation of vaccines/opt-out programs (9/15) (Table 4). Moreover, the Netherlands did not report any strategies, and Sweden uses online information from national health authorities.

Prison facilities providing vaccination services

Since no information is available from Belgium, 17/19 of the respondents work for prisons providing vaccination services. The vaccinations offered to PLP are illustrated in Table 5. Vaccinations against influenza (16/17),

Table 3 Routine assessment of vaccine-preventable diseases among European prison staff members

Country	Pneumonia	VZV	MMR	HBV	DTP	Flu/COVID-19	No Routine Evaluation
Belgium							●
Cyprus	●			●		●	
Croatia				●		●	
England				●		●	
Finland							●
France							●
Ireland				●			
Italy							●
Latvia							●
Luxemburg				●	●		
Malta		●	●	●	●	●	
Moldova							●
Netherlands							●
Norway							●
Portugal							●
Romania							●
Slovakia				●	●	●	
Spain (Catalonia)							●
Sweden	Not specified						
Ukraine	Not specified						

Table 4 Reported barriers on the vaccine uptake (on the left) among European prison staff members, and strategies and intervention suggested (on the right)

Country	Vaccine uptake: main barriers			Strategies and Interventions				
	Lack of knowledge/ Misinformation	Conspiracy Theory/ Misbeliefs	Vaccines are not free of charge	Knowledge dissemination	Peer-education	Question/ Answer sessions with experts	Active recommendation of vaccines/Opt-out programs	Other
Belgium	No Barriers							
Cyprus			●				●	
Croatia			●	●		●	●	
England	No Barriers							
Finland	●	●					●	
France	●	●		●			●	
Ireland	●			●				
Italy	●	●		●				
Latvia	●			●	●	●	●	
Luxemburg	No Barriers							
Malta	●			●	●		●	
Moldova	●						●	
Netherlands	No interest, lack of risk perception							●
Norway	No Barriers							
Portugal	●			●				
Romania	No Barriers							
Slovakia	●	●		●		●	●	
Spain (Catalonia)		●		●			●	
Sweden	●							●
Ukraine				●				

COVID-19 (16/17), HBV (15/17) and pneumococcal (14/17) infections are the main offered.

Discussion and conclusions

A total of 20 European countries responded to our survey. According to the results, the first dose/only dose of vaccines is offered to PLP mainly between one week and a month from prison entrance. COVID-19 is the most widely offered vaccine in prisons in European countries. In 17/20 respondent countries, vaccines are actively offered to PLP by healthcare workers. After release from prison, a follow-up program exists in only 8/20.

In Europe, 10/20 countries reported no infrastructural barriers to implementing vaccination services. Regarding vaccine uptake, the main barrier was “Lack of knowledge/ Misinformation”; Active recommendation of vaccines (opt-out programs) was reported as the primary strategy to increase vaccine uptake in prisons.

Vaccine hesitancy is one of the most critical obstacles to controlling vaccine-preventable diseases in prisons [12]. People living in prisons may refuse vaccination for various reasons, including but not limited to concerns about side effects [12], low levels of perceived risk [13],

distrust of authorities, vaccine, or vaccinator [14], or even pain from the needle [12]. These reasons highlight the need for scaling up a strong information, education and communication (IEC) system before or in parallel with the vaccination programs, focusing on risk. Working closely with external players, including NGOs and people with lived experience of incarceration, to provide IEC about the target vaccines and infectious diseases can help improve vaccine knowledge and help tackle vaccine hesitancy in prisons. In some countries, however, “criminal background checks” are a requirement for entering prisons, hindering the provision of services via people with lived experience of imprisonment [10].

In addition to the aforementioned personal barriers, the lack of vaccine uptake in prisons may be due to the unavailability of vaccines or vaccination programs. High turnover of PLP [15], divergent organizational cultures and priorities in prisons and community health systems [10], lack of equipment to maintain cold chain, and the need to provide advanced notice to prison authorities [13] are among the environmental, infrastructural, and policy-related issues resulting in the lack of vaccination services and vaccine uptake in prisons reported in the

Table 5 Prison vaccination services and vaccinations offered to PLP

Country	Seasonal Vaccinations/ Vaccination during outbreak		Childhood Life-Course Vaccinations/Booster doses				Cancer Preventable Vaccination				Fragile population		
	Flu	COVID-19	DTP	MMR	Meningococcal	HAV	HBV	HPV	Pneumococcal	Hib	VZV		
Cyprus	●	●	●	●	●	●	●	●	●	●	●	●	
Croatia	●	●	●	●	●	●	●	●	●	●	●	●	
England	●	●	●	It should be offered but, in practice, varies by prison	●	●	●	●	●	●	●	It should be offered but, in practice, varies by prison	
Finland	●	●	●	●	●	●	●	●	●	●	●	●	
France	●	●	●	●	●	●	●	●	●	●	●	●	
Ireland	●	●	●	●	●	●	●	●	●	●	●	●	
Italy	●	●	●	●	●	●	●	●	●	●	●	●	
Latvia	●	●	●	●	●	●	●	●	●	●	●	●	
Luxembourg	●	●	●	●	●	●	●	●	●	●	●	●	
Malta	●	●	●	●	In progress	●	●	In progress	●	●	●	●	
Moldova	●	●	●	●	●	●	●	●	●	●	●	●	
Netherlands	●	●	●	●	●	●	●	●	●	●	●	●	
Norway	●	●	●	●	●	●	●	●	●	●	●	●	
Portugal	●	●	●	●	●	●	●	●	●	●	●	●	
Slovakia	●	●	●	●	●	●	●	●	●	●	●	●	
Spain (Catalonia)	●	●	●	●	●	●	●	●	●	●	●	●	
Sweden	●	●	●	●	●	●	●	●	●	●	●	●	

literature. According to the UN's Mandela Rules, the state is responsible for ensuring that PLP are provided with healthcare services at least equivalent to that available in the community [16]. Hence, states are responsible for ensuring that vaccination services are in place in prisons, that are at least equivalent to the vaccination services available for the general population.

As mentioned previously, the protection of people living in prisons' health worldwide is the responsibility of various organizations, including ministries of health and/or justice, national health services, or multiple organizations [17]. The growing integration of prison health with public health services in recent years has been an attempt to improve the quality of healthcare services, respond to the shortage of prison staff members, address threats to the professional role of healthcare staff members, and acknowledge the human rights of people living in prisons [18]. This change started following the recommendations by the World Health Organization (WHO) and the UN Office on Drugs and Crime (UNODC) that public health services take responsibility for prison health [19]. Nevertheless, data on the impact of governance arrangements on health outcomes of PLP are limited and do not lead to clear conclusions [17]. Regardless of which organization is responsible for providing healthcare services in prisons, efforts should be undertaken to ensure the availability, accessibility and quality of vaccination programs for all people who live and work in prisons and continuity of care after release.

Due to numerous infrastructural and behavioral factors, people in prisons are at greater risk of acquiring and transmitting a number of infectious diseases, including COVID-19 [20]. Hence, at the beginning of the current COVID-19 pandemic, a large number of specialists tried to draw the attention of prison health policymakers to the potential threats of the pandemic in prisons in order to take immediate preventive actions [21, 22]. Accordingly, many countries undertook preventive actions, including developing guidelines, reducing the prison population, providing protective equipment and materials, e.g., masks and disinfectants, and scaling up vaccination programs. In the countries offering COVID-19 vaccines in prisons, vaccination plans varied from those which have explicitly prioritized PLP and prison staff members as a higher-risk group to the countries which have not explicitly referred to the prison populations in their national vaccination programs [23]. Although the prioritization of PLP in national vaccination programs was not assessed in our survey, COVID-19 vaccines were available to all people who lived and worked in all surveyed prisons, which is a great achievement for the healthcare systems of these countries. On the other hand, the lack of

availability of the other vaccines — in particular hepatitis A, meningococcal disease, and herpes — in the surveyed prisons is a serious cause for public health concern that needs to be addressed as soon as possible.

Limitations of the study

This study represents the first attempt to provide an overview of vaccination services offered in prisons across twenty European countries. While the selection of participants was carefully linked to specific regions or countries, limitations emerged due to varying availability and quality of the information provided. One such limitation was the restricted number of countries participating in our survey. Despite our efforts to engage a broader range of respondents and incorporate more countries, we could only solicit responses from 20 European countries. Another limitation was the possible lack of uniformity in the method of assessing vaccination status across different countries, as it was not possible to collect the specific methods used, which may have included self-assessment, incomplete vaccination records, or serological testing. Future research should aim to address these gaps by expanding participant selection criteria and focusing on more detailed data collection, to build a more comprehensive understanding of vaccination practices in correctional facilities.

The absence of data from Germany, a partner country in RISE-Vac, posed another limitation to our survey. While we managed to gather data from two prisons in two distinct states (Bundesländer) within Germany, these findings were not representative of the entire nation and were consequently excluded. In Germany, the provision of healthcare to incarcerated individuals is a state responsibility. This decentralized approach results in variations in healthcare policies across the 16 different states of Germany, including vaccination services available in prisons in this country.

Recommendations

Drawing on the findings, the following recommendations will assist prison health policymakers and healthcare providers in implementing effective vaccination programs for people who live and work in prisons:

- Healthcare and custodial staff members can act as vehicles to transmit infectious diseases from outside into prisons and vice versa; therefore, special attention should be paid to the implementation of vaccination programs, regular assessment of vaccination status, as well as tackling vaccine refusal among this critical population. Although the availability and

comprehensive coverage of vaccination programs against COVID-19 in prisons is an outstanding achievement, the current pandemic should not distract prison health systems from the other vaccine-preventable diseases in prisons.

- Lack of information is a primary barrier to the surveillance of diseases and the assessment of the effectiveness of interventions (e.g., vaccination programs in prisons). Prison policymakers should enable and support scientists in conducting research on vaccinations within prisons. This will provide essential evidence on various aspects of vaccine use and effectiveness, aiming to address existing gaps and reduce the impact of vaccine-preventable diseases in prison populations.
- Vaccine refusal is a common challenge for health systems in the community and prisons. A robust information, education and risk communication system in prisons before implementation or in parallel with vaccination services can help deal with this crucial issue and enhance vaccine uptake among people who live and work in prisons.
- Distrust of prison authorities is one of the main reasons for the lack of service uptake in specific vaccination services among PLP. Taking on board external players, including NGOs and people with lived experience of imprisonment as service providers, is recommended to build trust and improve vaccine uptake among people in prisons.
- For vaccines with more than one required dose, the course of vaccination is interrupted if PLP get released to the community before receiving boosters. This issue highlights the importance of scaling up and strengthening the immunization information systems to ensure vaccination completion among PLP after release.
- The experience accumulated during the COVID-19 pandemic is an invaluable asset that should be used to set up and expand preventive activities against infection transmission in prisons in the future.

Conclusions

We surveyed 20 European countries to assess the vaccine delivery models and reveal the gaps in the existing programs in prisons in Europe and abroad. According to the results, the availability of vaccines for PLP and prison staff members varies widely by country, setting, and type of vaccine. Initiating HBV vaccination program with support from the RISE-Vac project in Moldova is a good example, highlighting the importance of support from external players in providing evidence-based interventions in prisons. In addition, the lack of information on various aspects of vaccination in prisons is an obstacle to evaluating the efficacy, efficiency and effectiveness of the

program in the target institutions. In conclusion, prisons offer a distinct opportunity to deliver services to vulnerable populations who often find these services hard to access in the community. Since the majority of PLP will return to the community, vaccination in prison should be considered a public health investment.

Abbreviations

PLP	People Living in Prisons
EUDA	European Union Drugs Agency
EUROPRIS	European Organization of Prison and Correctional Services
HBV	Hepatitis B Virus
DTP	Diphtheria Tetanus and Pertussis
HAV	Hepatitis A Virus
Hib	Haemophilus influenzae type B
MMR	Measles Mumps and Rubella
HPV	Human Papillomavirus
VZV	Varicella Zoster Virus
COVID	19-Coronavirus Disease 2019
NGOs	Non-Governmental Organizations
IEC	Information, Education, and Communication
UNODC	United Nations Office on Drugs and Crime
WHO	World Health Organization
IIS	Immunization Information Systems

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

B.M. and M.P.T.F. have contributed equally to this manuscript. B.M., E.D.V., M.P.T.F., and L.T. contributed to the design and implementation of the research. D.P. and B.M. draft the survey. M.P.T.F. and E.D.V. were responsible for data collection and data analysis. M.P.T.F. was responsible for data visualisation. B.M., E.D.V., and M.P.T.F. wrote the main manuscript text. I.B., R.R., N.C., A.M. H.S., L.B., E.D.V. and L.T. reviewed the manuscript.

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Availability of data and materials

All data supporting the findings of this study are available within the paper and its Supplementary Information (Appendix 1).

Data availability

No datasets were generated or analysed during the current study.

Declarations**Ethics approval and consent to participate**

The RISE-Vac project has been approved by the ethics committee of the University of Pisa (approval number: 0049433/2022).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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